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important contribution to the history of botany for a period which is comparatively inaccessible to readers of English alone. One appreciates how gradually the science has evolved. Although the epoch-makers of the modern science were to come later, the roots of many of the leading principles are here disclosed. The style is clear and animated, requiring no needless effort to grasp the author's meaning. An excellent index is an additional source of satisfaction.—E. J. HILL.

Vegetation dynamics in the desert

There is no habitat where the vegetation appears more static than in the desert, but SPALDING² has now clearly shown that well-defined successions are to be found there as well as elsewhere, and that the "struggle for existence" involves "competition" between plant individuals as well as strenuous relations with untoward physical surroundings. The material here presented is the result of several years of intensive study on Tumamoc Hill (the location of the Desert Laboratory) and the adjoining valley, and it is concluded that the distribution of plants in that neighborhood can be accounted for by causes now in operation. The first chapter considers the plant associations and habitats. The river and irrigating ditches are relatively poor in aquatics. The river margin is fringed with an association in which cottonwoods and willows dominate, while the mesquite (*Prosopis velutina*) is the dominating species of the floodplain; an interesting phenomenon in the latter habitat is the invasion of the more xerophytic *Bigelovia Hartwegii*. Salt spots are present with characteristic halophytes, but the most pronounced of the latter (i.e., *Suaeda Moquini*) grows more luxuriantly along irrigating ditches than in salt spots. The washes, which are dry drainage channels, are characterized by the palo verde (*Cercidium*) and catclaw (*Acacia Greggii*), while the more xerophytic slopes are tenanted largely by the creosote bush (*Larrea*) and *Franseria* associations. The hill is characterized by *Fouquieria* and *Parkinsonia* on any exposure, while the giant cactus (*Cereus giganteus*) and *Encelia jarinosa* are essentially south-slope species; *Lippia Wrightii* equally characterizes north slopes, which are also much richer in the aggregate number of species and individuals than are other slopes. An account of the lichens is given by FINK, *Acarospora* being the most characteristic genus; the lichens generally are unusually xerophytic in structure.

The second chapter considers the detailed distribution (with maps) of some of the more characteristic species, and the third chapter has to do with environmental and historical factors. An account of the geology of the region is presented by TOLMAN, and of the soils by LIVINGSTON. There are extensive tables depicting the soil moisture, rainfall, temperature, and evaporation. MACDOUGAL contributes an interesting chapter on the origin of desert floras; xerophytes are regarded as of recent origin, and the view, formerly current, that the desert xerophytes have arisen through adaptation is opposed, at least as a general explanation. The final chapters give a review, discussion, and summary.

² SPALDING, VOLNEY M. Distribution and movements of desert plants. pp. v + 144. pls. 31. Carnegie Institution of Washington, Publication 113. 1909.

SPALDING concludes that even in deserts soils play a great part in distribution, and that physiographic factors play an efficient part as in the East. He finds that as the region is gradually base-leveled, the area of the mesquite association widens, that the palo verde-catclaw association advances similarly along the washes, and that the creosote bush advances along the slopes. The latter species is of wide range, appearing in areas as a pioneer and also remaining as the final possessor; and yet the xerophytic structures of this plant are simple as compared with the spectacular features of the giant cactus, whose range is much more restricted. The soil factors that appear most important are the soil water content, the percentage of alkali, and the soil texture (involving aeration). That not all distributional factors reside in the soil is shown by the fact that the giant cactus is chiefly an inhabitant of south slopes (attributed to the need for high temperatures), and especially by the fact that *Lippia Wrightii* is restricted to the north slope about the laboratory, while it is just as definitely restricted to the south slope in the mountains at an altitude of 1000^m above the laboratory. SPALDING has here given us one of the most notable of recent contributions, clearly showing that the intensive study of plant associations is quite as productive in results in deserts as in mesophytic climates.—H. C. COWLES.

Evolution

It is a matter for congratulation when the subject-matter of any great field is gathered together and systematized by a master hand. The first volume of LOTSY's lectures on the theories of descent has been reviewed in these pages,³ and the second volume should have been noticed sooner.⁴ The first chapters of the second volume consider various phases of Darwinism, noting first the factors that influenced DARWIN's investigations. The various prerequisites of Darwinism, such as variability, selective value, and the struggle for existence, are first considered. It is recognized that DARWIN did not attempt to explain variability, assuming it as given. Nor did DARWIN distinguish sharply between variations and mutations, a view that seems to the author to be borne out by KLEBS's experiments. After lectures on orthogenesis, selective value, the struggle for existence, the inheritance of deviations, there follow several lectures on the facts of paleontology and plant geography that are explained by the Darwinian theory. The objections to Darwinism are considered, the matter of the isolation of deviating individuals being considered one of the more important. The closing lectures deal with post-Darwinian theories, notably those of WALLACE, NÄGELI, and DEVRIES, while one lecture is devoted to Neolamarckism. At the close is an excellent bibliography. LOTSY's volumes form an indispensable compendium of information, not alone to students of evolution, but to all biologists, and particu-

³ BOT. GAZETTE 42:60-61. 1906.

⁴ LOTSY, J. P., Vorlesungen über Descendenztheorien mit besonderer Berücksichtigung der botanischen Seite der Frage, gehalten an der Reichsuniversität zu Leiden. Zweiter Teil. 8vo. pp. vi+420. pls. 13. figs. 101. Jena: Gustav Fischer. 1908. M 12; geb. M 15.